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Data for Analysing Productivity Changes in Danish Agriculture 1990-2007

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Preface

This documentation provides a detailed description of the datasets, which have been generated based from the database of representative farm accounts from the Institute of Food and Resource Economics. The datasets cover full time cash crop, dairy and pig farms, and the datasets have been prepared with the primary objective of analyzing productivity changes in Danish agriculture.

The datasets covering the time period 1990-2007 are available for researchers at the Institute of Food and Resource Economics to be run on local computers. As farm account data from 2007 onwards are collected by Statistics Denmark, analysis covering the period beyond 2007 requires that data processing and calculations are performed on local servers at Statistics Denmark.

Mogens Lund
Institute of Food and Resource Economics
University of Copenhagen
April 2011

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1. Introduction

Since Denmark joined the EU in 1973 agricultural productivity in Denmark has increased considerably. The Institute of Food and Resource Economics (FOI) has estimated that Total Factor Productivity (TFP) increased by 1.8 % per year from 1973 to 1980, and by 3.2 % per year from 1981 to 1993 (Hansen, 1990, 1995) with some differences between cash crop, dairy and pig farms. These changes were primarily attributable to technological changes (Hansen, 1995). Further analyses based on data from the period 1973-1995 were carried out by Rasmussen (2000) who showed that technological change was highest on cash crop farms (4.0 % per year) and lowest on dairy farms (1.0 % per year), with pig farms in between (2.2 % per year). The results also showed that technological changes increased significantly over time.

The analyses carried out by Hansen (1990), Hansen (1995) and Rasmussen (2000) were based on individual farm accounts collected by the Institute of Food and Resource Economics (FOI), University of Copenhagen. The Institute has collected representative farm accounts and produced annual farm income statistics from 1918 to 2007. In 2008 the collection of representative farms accounts and the production of farm account statistics were taken over by Statistics Denmark. The farms included in the database are selected annually using stratified random sampling from the total Danish farm population to obtain representativity concerning farm size, geographical location and economic size (Fødevareøkonomisk Institut, 2007(a)). Since Denmark joined the EU in 1973, the farm accounts collected by FOI (and from 2008 by Statistics Denmark) have been Denmark's official contribution to the EU farm account data network (FADN).

The two analyses performed by Hansen were based on analysis of changes in Total Factor Productivity (TFP) estimated as a quantity index of aggregate output (QY) divided by a quantity index of aggregate input (QX), i.e. TFP=QY/QX. The quantity indices QY and QX were estimated using a Fisher index (Balk, 1998, p. 8). Hansen did not perform any formal analysis of the individual components of changes in productivity but stated that the primary cause of changes in productivity is technical change. Hansen also found that changes in farm size contributed to a growth in TFP of 0.38 % per year.

The analysis performed by Rasmussen (2000) was based on the same type of farm account data as used by Hansen, but the estimation approach was different. Rasmussen used an econometric approach to estimate a cost function and used the results to estimate technical changes and changes in elasticity of scale for the period 1973-1995.

The analyses by Hansen (1995) and Rasmussen (2000) cover the period up till the mid 1990th. Since then there have been further changes in the production structure and the technology, and new policy regulations have been implemented. These changes have probably influenced productivity, and

there is an obvious need to update and extend earlier analysis of changes in agricultural productivity. At the same time, new methods for analysing changes in productivity have become available.

The objective of the present paper is to prepare a dataset to be used for an update of productivity analysis of Danish agriculture and for further analysis of changes in productivity using and comparing alternative methods of analysis. The basic data are the same as used by Hansen and Rasmussen, i.e. representative farms account data from the FOI database of agricultural account statistics. However, the data described in this paper covers the time period 1990-2007.

The possible use of different methods including for instance stochastic frontier analysis (SFA) and data envelopment analysis technique (DEA) call for careful preparation of data. This paper will describe this preparation of data only. The use of data for productivity analysis will be described in future documentation papers and articles following this paper.

2. The FOI farm account data

The farms included in the FOI database are selected annually using stratified random sampling from the total Danish farm population to obtain representativity concerning farm size, geographical location and economic size (Fødevareøkonomisk Institut, 2007(a)).

2.1. The raw data

The data described in this paper are based on farm account data covering the 18 year period 1990-2007. The *raw data* were made available to the author as SAS datasets with the names A1990w… A2005w, Adg2006, Adg2007, i.e. one dataset for each year. The full dataset for this 18 year period comprises 34,387 observations, which is an average of 1.910 observations (farm accounts) per year. The raw data are further described in Fødevareøkonomisk Institut (2007(b)).

2.2. Adding prices and new variables

Based on the variables in the raw data files, new variables were generated and added to the dataset. Input and output prices were also collected from the yearly price statistics from The Institute of Food and Resource Economics and added to the dataset.

The definition of the new variables generated is shown in Appendix 1. Part A1 of Appendix 1 refers to the years 1990-2005, in which the original variables have names starting with an *N* followed by a 1-4 digit number, and part A2 refers to the period 2006-2007, in which the original variables have names starting with a *V* and typically followed by a 6 digit number. Further explanation of the original variables is available from the author on request.

Price indices are provided in Appendix 2.

2.3. Farm types and deleted observations

After adding prices and new variables as described in Appendix 1 and 2, the data were organized as follows:

Part time farms were deleted, and the data described in the following therefore only include *full-time farms*, defined as farms with a standard labour requirement of 1,665 hours or more. The full time farms were further divided into four independent sub-sets of data according to farm type (farm specialization), i.e. *cash crop, dairy, pig, and other farms*.[1] Only the three first farm types are considered in the following.

The individual farms are identifiable through farm codes which are numbers stored in the variable N1 (year 1990-2005) and V101010 (year 2006-2007). Around two thirds of the farms in the sample within each year stay in the sample the following year. Hence, farms are on average represented in the sample around 3-4 subsequent years, and each of the three datasets is therefore an *unbalanced, rotating panel dataset*.

A few observations in each of the three datasets were deleted because some substantial calculated variables had zero values or were missing. Thus a total of 4 observations of crop farms were deleted because at least one of the variables BRUTY2, COSTX1, QX3, QX4A, COSTX5 and COSTX6 (see Appendix 1) had a zero or missing value. A total of 357 observations of dairy farms were deleted because at least one of the variables BRUTY2, BRUTY3, COSTX1, COSTX2, QX3, QX4A, COSTX5 and COSTX6 (see Appendix 1) had a zero or missing value. Finally, a total of 238 observations of pig farms were deleted because at least one of the variables BRUTY2, BRUTY4, COSTX1, COSTX2, QX3, QX4A, COSTX5 and COSTX6 (see Appendix 1) had a zero or missing value. The number of deleted observations corresponds to 0.1 % of the crop farms observations, and to around 3 % of the dairy and pig farm observations.

The final number of farms included in each of the three sub-samples of specialized full time farms is shown in Tables 1, 2 and 3. Dairy farms in Table 2 have the highest number of observations with an average of 553 farms per year. Pig farms in Table 3 come in second with 398 observations (farms) per year, and cash crop farms (Table 1) have the lowest number of observations with an average of 243 observations (farms) per year. The 3×18 SAS datasets were generated by SAS-programs with the names BRUTUDB_H_1990…BRUTUDB_H_2007, and were given the names ARAB1990…ARAB2007, DAIR1990…DAIR2007 and PIGS1990…PIGS2007 for cash crop farms, dairy farms and pig farms, respectively.

[1] The classification of farm systems is according to the definition of types of farming used in the EU agricultural statistics (FADN) (Institute of Food and Resource Economics, 2007). Cash crop farms comprise farms with more than 2/3 of the standard gross margin (SGM) from cash crops. Dairy farms comprise farms with more than 2/3 of the SGM from dairy cows, or at least 1/3 of the SGM from dairy cows and no other enterprise with more than 1/3 of the SGM. Pig farms comprise farms with more than 2/3 of the SGM from pigs, or at least 1/3 of the SGM from pigs and no other enterprise with more than 1/3 of the SGM

Table 1. Descriptive statistics for full time crop farms

Arable		Land, ha			Labour, hours			Standard Gross Margin, current DKK		
Year	N	MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
1990	277	14	947	116	1,700	20,421	3,656	9,665	925,668	114,439
1991	274	25	626	134	1,000	24,868	3,790	24,585	767,400	134,057
1992	262	18	642	128	1,000	16,750	3,659	22,069	762,912	132,866
1993	213	13	601	138	1,000	26,090	3,644	23,829	736,879	133,978
1994	213	8	682	134	1,000	29,890	3,652	31,394	571,202	127,407
1995	242	5	812	138	1,000	13,200	3,478	26,541	687,176	129,886
1996	226	18	813	145	1,000	15,705	3,359	31,567	673,021	138,996
1997	211	9	813	162	600	15,867	3,500	33,480	771,583	163,125
1998	176	45	803	167	967	17,600	3,573	44,055	957,749	174,283
1999	190	40	1,252	183	900	17,600	3,767	46,045	1,094,577	188,878
2000	223	24	1,236	179	1,300	17,600	3,806	23,675	1,116,154	190,996
2001	252	21	1,236	187	1,000	17,600	3,925	14,887	1,149,210	200,323
2002	254	26	1,121	196	1,150	19,000	3,917	25,773	1,268,826	209,730
2003	265	17	1,591	209	1,000	47,000	4,158	15,857	2,810,870	231,282
2004	265	36	1,706	210	1,200	21,415	3,983	26,975	1,538,174	220,973
2005	273	44	1,710	221	800	49,000	4,172	40,397	2,457,326	241,984
2006	272	46	1,710	246	700	34,920	4,530	33,147	2,151,012	252,700
2007	290	32	1,730	251	800	34,150	4,766	49,782	1,877,665	293,536

Table 2. Descriptive statistics for full time dairy farms

		Land, ha			Labour, hours			Standard Gross Margin, current DKK		
Year	N	MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
1990	611	8	234	56	1,700	12,800	3,955	16,260	386,361	92,294
1991	613	2	234	60	965	13,560	4,003	19,572	366,316	105,864
1992	581	1	233	63	1,047	12,600	4,058	23,247	404,935	110,604
1993	588	1	472	64	1,400	11,050	4,102	22,204	464,943	116,631
1994	572	9	453	67	1,150	13,100	4,147	26,891	471,717	120,862
1995	600	10	437	69	1,000	14,536	4,147	30,754	736,171	130,366
1996	626	11	382	72	1,300	20,241	4,213	27,673	770,089	136,401
1997	592	14	397	75	1,600	21,233	4,213	39,653	819,963	144,836
1998	477	5	450	81	1,508	17,000	4,294	39,551	1,009,179	155,521
1999	549	8	376	94	1,665	15,125	4,521	33,319	790,809	166,036
2000	594	5	454	98	1,725	17,730	4,559	38,758	1,016,211	176,509
2001	575	16	517	102	1,263	21,600	4,645	33,083	1,018,097	180,806
2002	558	4	615	110	1,000	17,400	4,718	38,140	1,088,732	198,688
2003	508	9	529	117	1,500	17,700	4,817	39,748	1,198,833	212,542
2004	494	1	657	122	1,150	18,700	4,780	39,565	1,363,981	220,285
2005	477	13	636	128	1,100	25,700	5,038	48,552	1,662,216	246,177
2006	467	19	681	123	1,500	25,300	5,194	46,307	2,050,540	273,156
2007	478	1	658	147	1,600	27,000	5,434	57,764	2,171,163	306,409

Table 3. Descriptive statistics for full time pig farms

Pig		Land, ha			Labour, hours			Standard Gross Margin, cur. DKK		
Year	N	MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
1990	372	5	380	59	1,700	19,000	4,223	21,028	887,841	135,461
1991	399	1	415	64	900	20,500	4,349	32,826	1,021,508	155,873
1992	414	6	340	65	1,100	23,675	4,485	33,932	1,157,711	164,734
1993	367	1	278	68	1,100	19,400	4,376	37,628	849,609	178,080
1994	401	3	284	68	1,400	20,700	4,284	37,913	974,620	186,006
1995	391	10	459	75	1,100	22,200	4,307	37,466	816,765	185,267
1996	411	1	455	76	1,200	22,800	4,389	36,014	978,869	187,996
1997	405	3	522	85	1,200	24,000	4,621	41,742	1,249,890	202,811
1998	329	6	391	84	1,200	17,100	4,647	45,336	1,206,964	213,469
1999	387	3	333	94	1,500	22,900	4,795	36,210	1,291,545	258,330
2000	427	9	485	108	1,500	23,600	5,328	51,103	1,489,558	273,305
2001	452	8	418	116	800	30,200	5,697	39,955	1,439,597	275,755
2002	442	2	472	121	1,474	32,200	5,720	52,862	1,726,344	298,736
2003	392	1	555	136	1,500	33,200	6,412	55,753	1,847,812	375,855
2004	439	0	644	148	1,500	32,000	6,636	64,444	1,913,918	386,463
2005	413	1	510	155	1,500	31,190	6,624	65,328	1,600,353	385,174
2006	388	1	542	163	1,600	33,000	7,006	65,230	2,141,453	433,646
2007	334	4	756	173	1,510	36,400	7,069	61,864	2,067,059	464,862

For all three farm types, the acreage per farm has more than doubled over the 18 years. Cash crop farms have the largest acreage, and in 2007 the average size of the cash crop farms included was 251 ha. Dairy and pig farms are about the same average, but in the last few years the pig farms have become larger, and in 2007 the average acreage of the pig farms included was 173 ha. Labour input was around 4,000 hours per farm in 1990 for all three farm type. While labour input has stayed at this level over the years on crop farms, dairy farms and especially pig farms have grown measured in labour input. The increasing size of pig farms compared to the other two farm types becomes more clear in Table 3, where the farm size measured in Standard Gross Margin (SGM)[2] is more than 450,000 DKK on pig farms in 2007, compared to a level of around 300,000 DKK on cash crop farms and dairy farms.

There is a large variation in the number of (consecutive) years in which the individual farms stay in the database, and many farms stay in the database only one or two years. This is illustrated in histograms shown in Figures 1, 2, and 3, where the vertical axis measures the number of farms, and the horizontal axis measures the number of observations (years) per farm. The distribution is heavily skewed with many farms having only one year of observation and only very few farms have more than ten years of observations. Thus, the dataset is clearly a very incomplete panel data set. On the other hand, the farms included in any year are a representative sample of all Danish full time farms.

[2] See definition of SGM in FOI agricultural account statistics (2007(a))

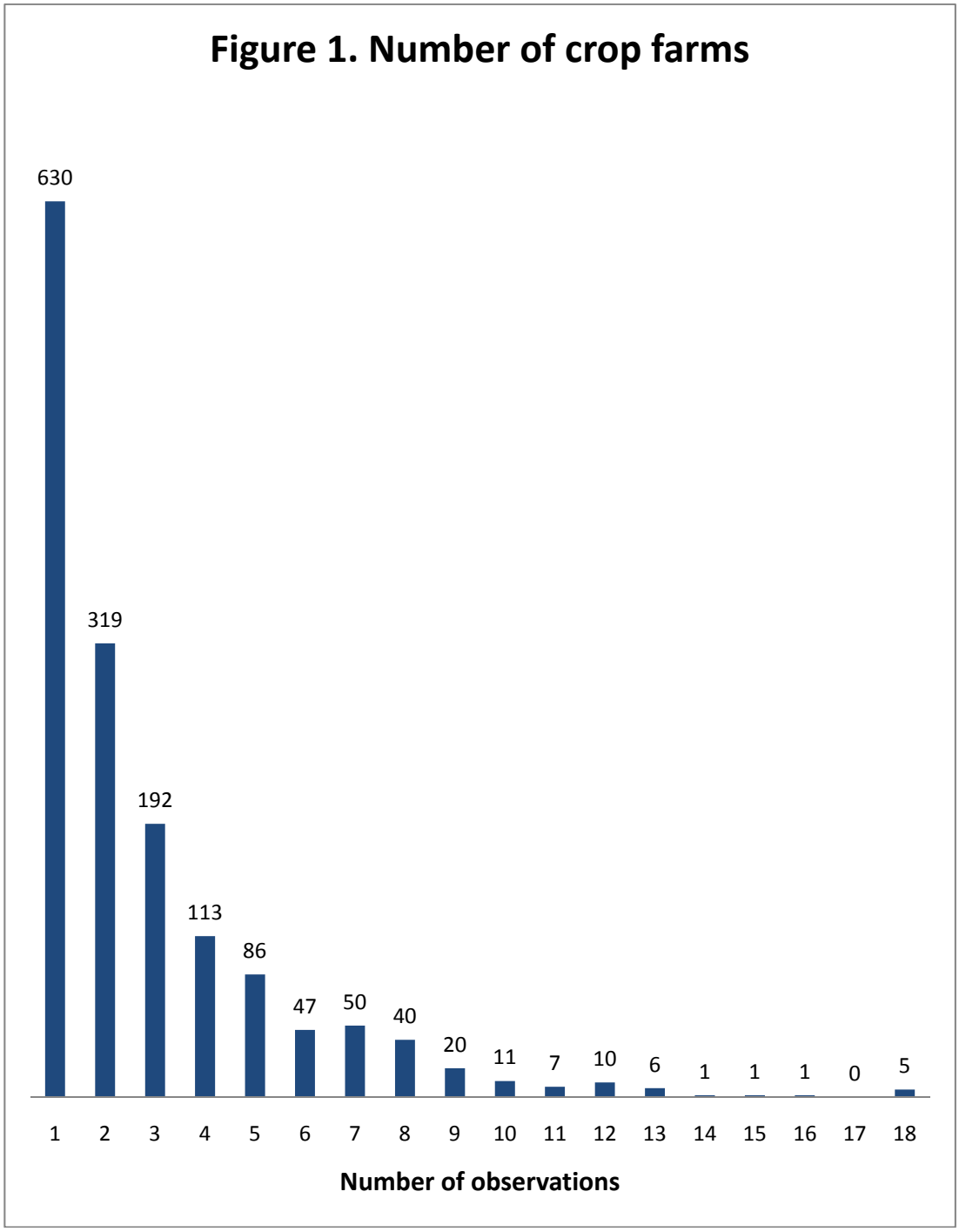
Figure 1. Number of crop farms
630
319
192
113
86
47
50
40
20
11
7
10
6
1
1
1
0
5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Number of observations

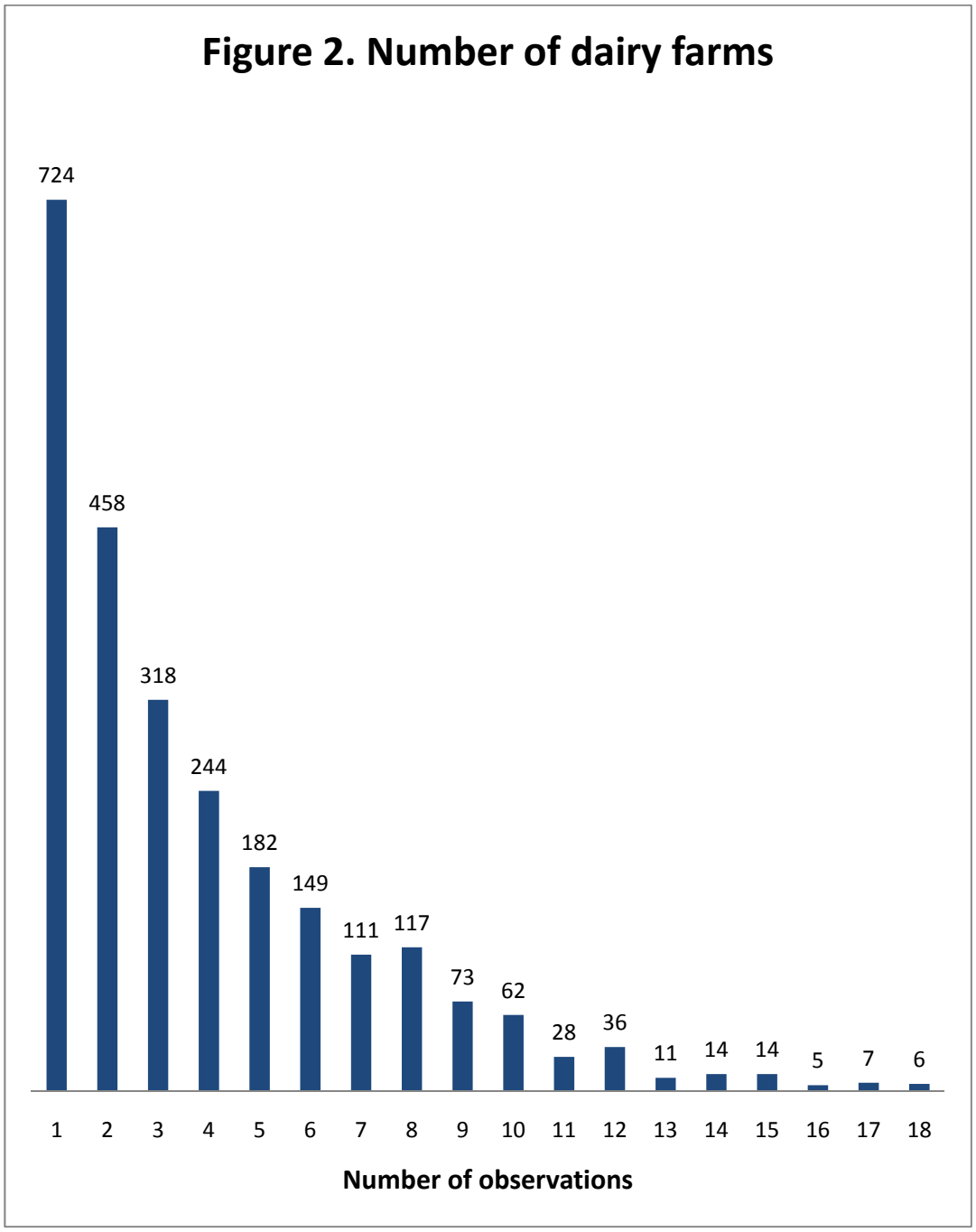
Figure 2. Number of dairy farms
724
458
318
244
182
149
111
117
73
62
28
36
11
14
14
5
7
6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Number of observations

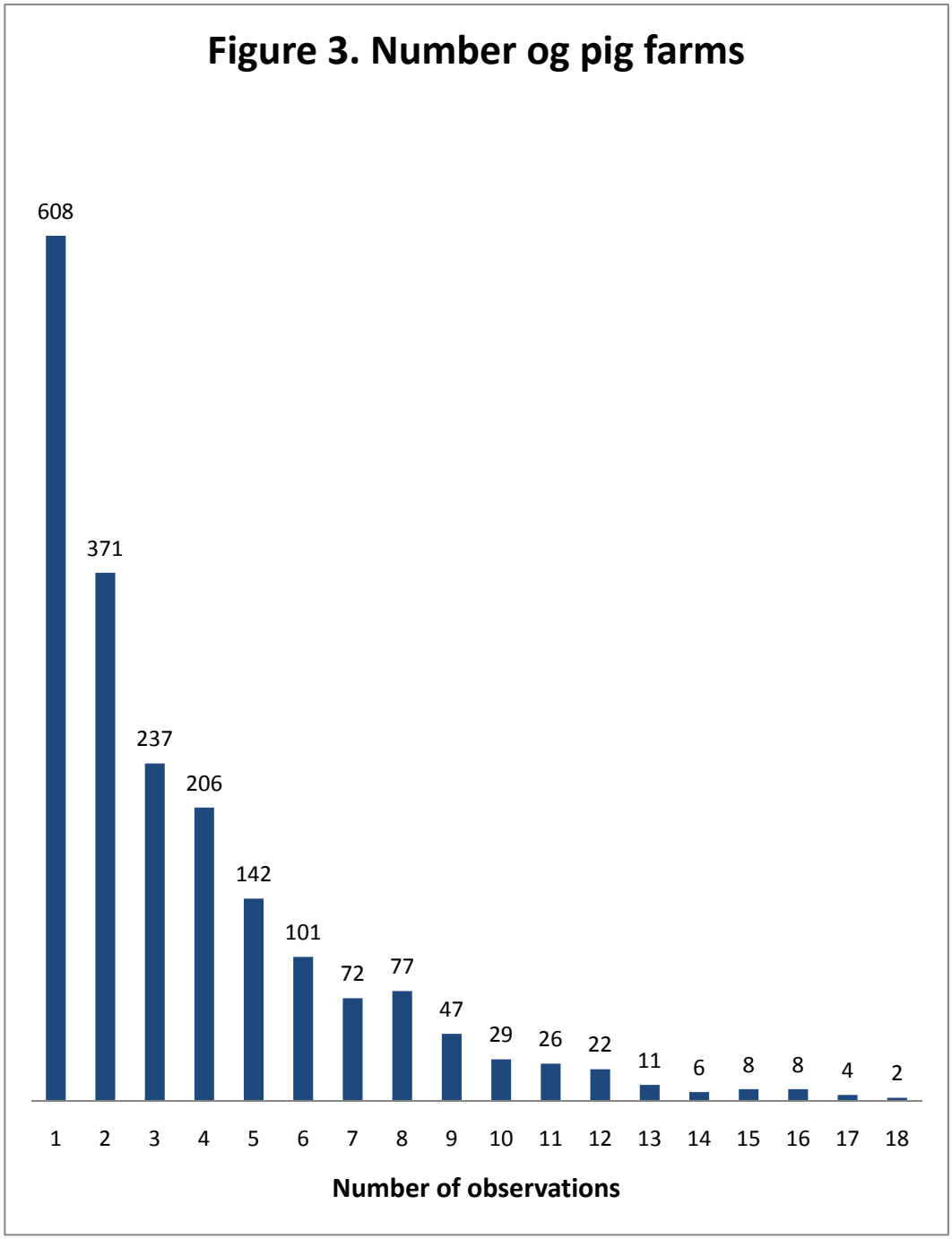
Figure 3. Number og pig farms
608
371
237
206
142
101
72
77
47
29
26
22
11
6
8
8
4
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Number of observations

3. Contents of the farm accounts

The farm accounts provide a relatively detailed description of the economic result and use of resources and capacity of the individual farms. In the period 1990-2005, this description is in the form of 2,200 individual account variables with variable names N1 – N2200. In 2006 the number of variables was increased, and the variable names were changed to V101010 – V290995[3]. Some of the variables describe the farm in more general terms (geographical region, age of farmer, farming system, labour input, acreage, rented land, number of various types of livestock, etc.). In 1990-2005 the variable N1 is used to store a unique *farm code* in the form of a *number*, which follows the farm over time. This facility makes panel data analysis possible. The name of the corresponding farm variable in 2006 and later is V101010.

The production described in the form of input and output is specified in the accounts in the form of around 50 individual outputs and around 50 individual inputs measured as the value of production and the value (cost) of input, respectively. Besides the specification of the individual outputs and inputs in the form of *values*, many of the outputs are also specified in the form of *quantities*. For *some* of the products (for instance milk, grain, piglets) this provides the opportunity to calculate farm and year specific output prices (price = value divided by quantity). However, input quantities are in general *not* available, and therefore in general it is not possible to capture farms specific *input* prices.

Productivity analysis using econometric and other methods requires data on the *quantities* of inputs and outputs. As most firms produce more than one output and certainly all firms use more than one input, estimation of a single measure of productivity (Total Factor Productivity[4]) requires some kind of *aggregation* of outputs and inputs. According to the theory of index numbers (Diewert, 1981), any relevant (i.e. economic based) aggregation (estimation of index numbers) requires knowledge of prices. Therefore, productivity analysis requires data on input and output quantities and input and output prices.

As mentioned above, it is possible for some of the individual outputs to calculate farm specific output prices. However, as this is not the case for all outputs, and certainly not the case for any of the inputs, it was decided (in accordance with earlier analyses (Hansen, 1990, 1995 and Rasmussen, 2000) to use the same input and output prices for all farms. As farmers are normally considered to be price takers both in the input market and in the output market, this is not considered a very restrictive assumption in a well functioning market. *The prices* used in this paper are prices from the yearly Agricultural Price Statistics from the Institute of Food and Resource Economics (1990-2007) (see Appendix 2).

[3] The datasets generated as the outcome of this paper use variable names as defined in the 1990-2005 accounts (N1-N2200 names) for the period 1990-2005, and names as defined in the 2006-2007 accounts (V101010-V290995 names) for the period 2006-2007. For further details, see Appendix 1.

[4] Total Factor Productivity (TFP) is defined as: TFP=QY/QX, where QY is a measure of aggregate output quantity and QX is a measure of aggregate input quantity.

4. Aggregation of prices and quantities

As mentioned before, the accounts include production values of around 50 individual outputs and costs of around 50 individual inputs. For econometric and other empirical economic analysis this number is much too high and has to be reduced to a reasonable number of variables. The ideal or optimal number of variables depends on the choice of model and the number of observations available. The balance is on the one side to keep the individual variables to provide as detailed a description of the production as possible, and on the other side to reduce the number of variables to have enough of degrees of freedom to provide reliable parameter estimates. One should also consider that models based on the logarithm of the variables cannot be used when the variables have zero or negative values. The choice also depends on the characteristics of the individual inputs and outputs, and the way in which they are able to substitute for each other. Correlation between the individual inputs and the individual outputs also has to be considered, and inputs (and outputs) that are highly correlated may just as well be aggregated.

Based on a mix of considerations including the consideration of what seems to be the tradition within econometric analysis of agricultural production and what would be the possible models in which the data would be used as input (for instance Stochastic Frontier Analysis and DEA-analysis), it was decided to aggregate inputs into *six main input quantity variables*, crop inputs[5] (X1), feedstuff and veterinary services (X2), land (X3), labour (X4), machinery (X5) and other capital (X6). The use of fuel is included in X5 and the use of other energy (mainly electricity) is included in X6. In some cases it may be useful to have all energy as just one variable. To facilitate this objective, three other variables were constructed: energy (X9), which is all energy (fuel and electricity), machinery excl. fuel (X7), and other capital excl. other energy (X8). Thus, one may use X1-X6 as input variables, or X1-X4 and X7-X9 as input variables.

While these six/seven main inputs are used as input variables for all three farms types, it was decided to differentiate aggregation of output according to farm type. For each of the three sub-sets (cash crop, dairy, and pig farms), the individual outputs were aggregated into two or three *main outputs* as follows. For *crop farms*, two outputs are distinguished: 1) cash crop products (Y2)[6] and 2) other products (Y9), where 'other products' (Y9) includes all cattle products, pigs, other animal products and subsidies. For *dairy farms*, three outputs are distinguished: 1) cash crop products (Y2), 2) cattle products (beef and milk) (Y3), and 3) other products (Y7), where 'other products' (Y7) includes pigs, other animal products (except cattle products) and subsidies. For *pig farms* three outputs are distinguished: 1) cash crop products (Y2), 2) pigs (Y4), and 3) other products (Y8), where 'other products' (Y8) includes cattle products, other animal products (except pig products) and sub-

[5] Includes seed, fertilisers and pesticides as the major input items

[6] Until and including 2005, Y2 does *not* include the value of home grown roughage and grain used internally on the farm. From and including 2006, Y2 includes the value of home grown roughage and grain used internally on the farm. This means a data break from 2005 to 2006.

sidies. The main product, *cash crops* (Y2) includes all the individual crops, i.e. grain, grass seed, rape, etc. The area payment (until 2005) and the *single payment* (from 2005) are included in the *other products*. *Cattle products* includes milk and beef, while and EU subsidies for suckling cows and male animals are included in *other products*. *Pig products* includes piglets and slaughter pigs.

While there are two outputs for crop farms (Y2 and Y9), three outputs for dairy farms (Y2, Y3 and Y7) and three outputs for pig farms (Y2, Y4 and Y8), it is also possible to use models with five outputs for any farm type. The output variable Y5 includes *subsidies* and the output variable Y6 includes other animal products than cattle products (Y3) and pig products (Y4). Therefore, the five outputs Y2, Y3, Y4, Y5 and Y6 also provide an exhaustive description of output from any farm type.

The output quantity indices were calculated by dividing the total revenue of each of the eight output aggregates with the Törnqvist price index[7] for the output elements involved.

The six main inputs are calculated as follows: 'Land' (X3) is the hectares of land registered in the accounts. To adjust for differences in soil quality, a new variable X3K was generated. X3K is the number of hectares (X3) multiplied by a soil quality index, as described in Appendix 3. 'Labour' (X4A) is the number of working hours including the farmer, family members and paid labour registered in the accounts (variable N588).[8] The quantities of the remaining four inputs ('crop inputs' (X1), 'feedstuff'[9] (X2), 'machinery' (X5), 'other capital' (X6)) were calculated by dividing the total cost of each of the four input types with the Törnqvist price index[10] for the input elements involved. 'Crop inputs' includes fertilizers, seed, pesticides, lime and other crop cost. 'Feedstuff' includes concentrates, roughage[11], veterinary services, medicine, control and insemination. 'Machinery' includes interest, depreciation, maintenance, insurance, contractor and fuel. 'Other capital' includes interest of stocks as well as, interest, depreciation, maintenance and insurance of buildings and energy. The input prices (P_i^t) used are prices from the yearly Agricultural Price Statistics from FOI. Prices in a given year are the same for all farms.

4.1. Price indices

Alternative price indices were considered including Laspeyres, Paasche and Fisher indices described in for instance Balk (1998) and Coelli, Prasada Rao, O'Donnell, & Battese (2005). As mentioned by Diewert (1981), the Törnqvist price index (named after Törnqvist (1936)) has the advantage of being a so-called superlative index, because it is an exact index under the translog flexible

[7] See section 4.1

[8] Labour cost (including estimated cost of family labour) is also available, and therefore labour input may alternatively be estimated by dividing the total labour cost by the wage of farm labour (X4B).

[9] In the following I use the term 'feedstuff' as a short name of X2

[10] See section 4.1

[11] Until and including 2005, *roughage* only includes roughage bought from outside the farm. From and including 2006, *feedstuff* also includes the value of home produced roughage and grain. This means a break in the data from 2005 to 2006.

functional form of the production technology. It is therefore regarded as a better index than the others, and therefore chosen here.[12]

The general form of the chain version[13)] of a Törnqvist input (output) price index is:

$$P^{t+1} = \left[\prod_{i=1}^{n} \left\{ \frac{p_i^{t+1}}{p_i^t} \right\}^{½(s_i^{t+1}+s_i^t)} \right] P^t \qquad (1)$$

where P^t is the estimated price index of the input (output) aggregate in question in year *t*, p_i^t is the price of the individual input (output) *i* in year *t* and s_i^t is the cost (revenue) share of the individual input (output) *i* in year *t*.

The following example illustrates the use of equation (1). The input X1 includes fertilizers as the major input. However, other inputs like seed, pesticides, lime, etc. are also included in X1. Thus, the total cost of the inputs included in the aggregate variable 'Crop inputs' (X1) is the sum of the cost of seed (N1077), the cost of fertilizers (KUNST=N1085+N1071+N1074), the cost of pesticides (N1082), the cost of lime and marl (N1109) and cost of sundries (N1095)[14].

The total cost of 'crop inputs' (X1) is therefore COSTX1=N1077+KUNST+N1082+N1109+N1095. Correspondingly, the cost *share* of each of the five individual inputs is therefore estimated as: s_1= SX11=N1077/COSTX1, s_2=SX12=KUNST/COSTX1, s_3= SX13=N1082/COSTX1, s_4=SX14=N1109/COSTX1 and s_5=SX15=N1095/COSTX1. The prices of the individual inputs are p_1=P16, p_2=P17, p_3=P18, p_4=P60, p_5=P61, where P16…P61 refer to the prices/price indices shown in Appendix 2. Inserting period *t* and period *t*+1 values of s_i and p_i (*i*=1…5) in (1) provides for calculation of the term in the square parenthesis, and multiplying this by the base price P^t gives as the result the price index P^{t+1} of input X1 in period *t*+1. (In Appendix 1 the price index of input X1 is named PX1, and similar names are given to the other inputs). Dividing total costs COSTX1 by the price index PX1 results in the quantity index QX1.

'Feedstuff' (X2) includes concentrates, roughage (bought), and veterinary services, medicine control and insemination. From 2006, X2 also includes the value of home-grown roughage and grain used on the farm. 'Machinery' (X5) includes interest, depreciation, maintenance, insurance, con-

[12] A number of empirical analyses found in the international literature (see for instance Irz & Thirtle, 2004) use deflated values as quantity indices. If the data covers long time series this is considered a very rough way to generate quantity indices, especially if relative prices within each group change considerably.

[13] The advantage of using a *chain index* is shown in Diewert (1978). See also Coelli et al. (2005, p. 155).

[14] N1077,…, N1095 are the variable names of the account items. In the following I use capital letters to refer to the same items in the Appendix 1, where all the definitions are given. For more details concerning definition of X1 in the two sub-periods 1990-2005 and 2006-2007, see Appendix 1.

tractor and fuel. 'Other capital' (X6) includes interest of stocks, interest, depreciation, maintenance and insurance of buildings, and energy. The production value of each aggregate output is named BRUTY*j* (*j*=2, 3, 4, 5, 6, 7, 8, 9), and the corresponding estimated quantity indices are named QY*j* (*j*=2, 3, 4, 5, 6, 7, 8, 9).

The effects of pure price changes (cyclical gains, in Danish: Konjunkturgevinster) are included in the gross output in the FOI accounts from 2006 onwards (but not before). These economic gains are listed separately in the accounts from 2006, and therefore it is possible to deduct them if necessary. As all other account values are in real terms and as intangible short term gains and losses will not be included, these cyclical gains were removed. For all animal products it is easy to deduct cyclical gains as they are listed individually in the accounts for cattle, pigs, horses, etc. For crop products, cyclical gains are stated in the accounts as a lump sum, and are not distributed on cereals, rape, forage, seed, etc. Consequently, cyclical gains were distributed on 'Grain', 'Other cash crops', 'Roughage' and 'Straw and other by-products' in proportion to the value of opening stocks of these crop products. The resulting cyclical gain for 'Grain' is deducted from gross output of grain. The estimated cyclical gains of 'Roughage' and 'Straw and other by-products' are deducted from gross output of roughage. The estimated cyclical gain of 'Other cash crops' is distributed peas, grass seed, clover seed, rape, eating potatoes, industrial potatoes and other crops in proportion to the gross output of these crops (see details in Appendix 1, part A2).

The price indices are scaled so that the price index for the first year (1990) is 100, i.e. $P^{1990} \equiv 100$. Price indices for the individual farms in the following years are estimated as follows: If the farm in question is in the dataset in year *t* and year *t*+1, then the shares (s_i^t and s_i^{t+1}) in equation (1) refer to the shares for the farm in question. If the farm is in the dataset year *t*+1, but not in year *t*, then the farm is given the same share s_i^{t+1} in year *t* and *t*+1.

4.2. Calculation of capital input

As with the other inputs, quantity indices of 'machinery' (X5) and 'other capital' (X6) are calculated by dividing the aggregate cost of these capital items by a capital price index. The cost of capital of machinery (X5) includes interest, depreciation, maintenance, insurance, contractor and fuel (see Appendix 1). For other capital (X6) the cost of capital includes interest, depreciation, maintenance, insurance etc. (see Appendix 1). Except interest, each of these items is specified in the farm accounts, and corresponding prices or price indices are also readily available. The only thing missing is therefore the cost item, interest, and the price of interest costs.

Interest as a cost of a capital item (for instance a machine) is the rate of interest (*i*) times the value (*V*) of the capital item in question. The value of the capital item itself can be defined as being the product of quantity (*X*) and price (*p*), so that the value (*V*) is *V*=*pX*. The interest cost (*C*) is therefore *C*=*iV*=*ipX*. If we divide cost (*C*) by the price (*p*) we get quantity (*Q*), i.e. *Q*=*C*/*p*=*ipX*/*p*=*iX*. Thus, the quantity (flow of services) from a capital item is the interest cost *C* divided by the capital price

p. The interpretation of this flow *Q* of services is that it is a flow rate pr. capital unit (corresponding to the interest rate I) times the number of capital units (*X*).

Prices (or price indices) of capital items (*p*) are readily available. All we need to be able to calculate the quantity *Q* is therefore the interest cost *C*, which apparently is $C=iV$. As the value (*V*) of capital items is available in the farms accounts, the only thing missing to calculate *C* is the interest rate (*i*).

In a simple world with no taxes, zero inflation, no subsidies on interest payments and no changes in relative prices, the interest rate (*i*) would be easy to determine. It would simply be the prevailing rate of interest in the society. But in reality, things are not so simple. First of all inflation is not zero and relative prices change. Also, companies normally pay taxes, and as the interest on borrowed capital is deductable in the taxable income, the tax rate after including the effect of the deduction of interest on debt is lower than the pre-tax interest rate. If all interest is tax were deductable, then the efficient (after tax) interest rate is (1-*s*) times the interest rate, where *s* is the tax rate. However, companies finance using both debt and equity capital. As interest on equity capital is not deductable in the taxable income, the efficient after tax interest rate depends on the capital structure. Add to this that the efficient tax rate (*s*) may change from one company to the other, and also may change over time. Further, the interest on debt may vary from one company to the other, and also over time. Finally, some farmers receive subsidies to pay interest on debt, subsidies which influence the net interest payment on debt.

To sum up, there are considerable challenges in estimating a correct interest rate *i*. The correct way to calculate the interest and depreciation part of the cost of capital is to estimate the *user cost of capital* as defined by e.g. Diewert (1980, p. 471).

In this context, consider also the cost item *depreciation*. Depreciation is best explained as the value of the 'evaporation' of the asset in question over time, and calculation therefore involves the estimation of how much 'evaporates' during the time period in question, and what the price of the 'evaporated' part of the asset is.[15]

First consider assets like livestock and stocks of output in store. Normally, there is no depreciation cost for these types of assets, as changes in the value over time is either due to changes in prices (as mentioned above) or due to buying or selling including replacing old animals (e.g. cows, sows, etc.), which is accounted for elsewhere in the accounts.[16]

This is not the case with assets like machines and buildings. Changes in the value over time may - as with livestock and stocks in store - be due to changes in prices or to buying and selling. But it may also be due to 'evaporation', the value of which we call depreciation.

[15] The term depreciation should not be confused with the change in the amount of assets due to buying and selling.
[16] Changes in prices are accounted for by adjusting the interest rate as mentioned in the first part of this Section. Buying and selling is accounted for directly as value of output or cost of input.

Depreciation does not have the same status as other costs because depreciation may or may not be fully deductable in the taxable income. Also the timing of the tax deductable part of depreciation may vary from one asset to the other due. Therefore, if the tax effect should be taken into account, it would be necessary to differentiate between machinery and buildings.

The correct way to calculate the interest and depreciation part of the cost of capital when there are taxes and changes in relative prices is to estimate the *user cost of capital* as defined by e.g. Diewert (1980, p. 471). In an earlier version of this paper (Rasmussen, 2008), considerable effort was put into the correct estimation of the cost of capital by estimating the user cost of capital by taking all the above mentioned details into account. However, the results were not reliable. In a number of cases (years) the user cost of capital was negative, which involved serious empirical problems as input prices in most models have to be positive. Also the variability from year to year was often very high, which from an ex post position may be correct, but which from an ex ante perspective is rather problematic when modeling economic behavior.

To simplify calculations and at the same time to take into account the major elements involved in the calculation of interest costs as mentioned above, the following procedure was used:

1. **Livestock and stocks in store**: *Interest* cost is calculated by multiplying the stock value at the beginning of the year by the real rate of interest calculated as the market rate of interest measured as the nominal rate of interest on credit institute loans (RENTE) minus the rate of inflation (INFLA). No depreciation.
2. **Machinery and buildings**: *Interest* cost is calculated as for livestock and stocks in store (as above) minus EU subsidy for interest payment (‘Forbedringsstøtte’). ‘Forbedringsstøtte’ is divided on machinery and buildings according to value. *Depreciation* is taken directly from the accounts.

Use of the real rate of interest implies calculation of capital costs in real terms. This choice implies that other cost and revenue measures should also be in real terms. Thus, the choice of calculating the cost of interest in real terms is consistent with the decision to remove the effects of pure price changes (cyclical gains, in Danish: Konjunkturgevinster) from the gross output (see Section 4.1.).

4.3. Subsidies

The major subsidies during the period 1990-2005 are area payment for crop production and, from 2006, the single payment. Besides this, there are minor subsidies for animal production and other subsidies for crop production.

When calculating productivity, there are two ways to handle subsidies. 1) To deduct the subsidy in the corresponding cost items (for instance, deduct subsidies for beef production in the feed cost or the cost of renting land for feed production), or 2): To consider the subsidy as a product (an output) in line with other products like grain, meat or milk.

It is important to maintain some kind of consistency. When the subsidy is included as a reduction in costs, it should not be treated as an output as well. On the other hand, if subsidy is not included as a cost reduction, it must be taken into account as an output. For instance, consider a farmer who buys one hectare of land with the sole purpose of generating EU-subsidy in the form of single payment. Depending on the price of land, this may be a rational decision. However, if we only include the input increase (one hectare of land) without also including the output generated in the form of subsidy from this one hectare of land, then the productivity measure decreases. If on the other hand the subsidy is deducted in the capital cost of land (and we assume that the subsidy exactly covers the capital cost of land), then the net capital cost will be zero, and the measure of productivity is not affected.

In the dataset described in this paper, the input, land, is measured in number of hectares. This means that if one hectare is added without any change in production, then productivity decreases. However, from the point of view of the farmer, this result is wrong if the farmer receives subsidy from the land, and the subsidy covers the capital cost of land. Therefore, if the input 'land' is measured in number of hectares then - from a farmer perspective - subsidy on land should be included as an output.

The same is the case with the other (minor) subsidies included in the accounts. To keep consistency with the other definitions, all subsidies are measured as output. However, the one exception is the EU subsidy for interest payment on building and machinery investments ('Forbedringsstøtte'), which - as mentioned earlier - is deducted the interest part of the capital costs.

5. The final SAS datasets and SAS programs

The 3×18 SAS-datasets for crop farms, dairy farms and pig farms (one for each of the 18 years), were used as a basis for generating aggregate prices and quantities. The SAS-programs used for cash crop farms, dairy farms and pigs farms have the names ARABLE_H, DAIRY_H and PIGS_H, respectively, and the generated SAS datasets covering the full period 1990-2007 have the names ARAB9007, DAIR9007 and PIGS9007, respectively.

The variables included in the three datasets are selected variables from the original farm accounts (variable names N1-N2200 for 1990-2005 and variable names V101010 – V290995 for 2006-2007). Besides this, the datasets include the following variables:

1) Prices (or price indices) of each of the individual inputs and outputs. These prices have names P1-P74 and are also shown in Appendix 2 of this paper.
2) Quantities of each of the individual inputs (outputs), estimated as costs (value of production) divided by the relevant prices mentioned under 1) above. These quantities are named X*ij* (Y*kl*), where *i* (*k*) refers to the number of the input (output) aggregate to which it is allo-

cated, and *j* (*l*) are consecutive numbers of the input (output) items included in the input (output) aggregate in question. Thus, the quantity variable Y28 refers to the quantity of sugar beet, because sugar beet is number 8 of the individual outputs that are included in the output aggregate crop products, which has the variable name Y2.

3) Shares of cost (production values) of the individual inputs (outputs) estimated as cost (production value) of the individual inputs (outputs) divided by the total cost (production value) of the aggregate input (output) to which it belongs. These shares are named SX*ij* (S*kl*), where *i* (*k*) refers to the number of the input (output) aggregate to which the input (output) belongs, and *j* (*l*) are consecutive numbers of the input (output) items included in the input (output) aggregate in question. Thus the share S28 refers to the share of sugar beet in the total value crop production, because sugar beet is number 8 of the individual outputs that are included in the output aggregate crop products, which has the variable name Y2.
4) Prices indices of aggregate inputs (outputs) with names PX*i* (PY*k*), where *i* (*k*) refers to the number/name of the input (output) aggregate. Thus, PY2 refers to the price index of the output aggregate crop products, because this aggregate has the name Y2.
5) Costs (product values) of aggregate input (output) estimated as the sum of costs (product values) of the individual input (output) items that belongs to the input (output) aggregate in question. The costs (product values) are named COSTX*i* ((BRUTY*k*) where *i* (*k*) refers to the number of the input (output) aggregate. Thus, the product value of crop products has the variable name BRUTY2 because it is the sum of the product values of the items that are included in the aggregate crop products, which has the nameY2.
6) Quantity indices of aggregate input (output) estimated as COSTX*i* ((BRUTY*k*) divided by PX*i* (PY*k*), i.e. cost (product value) divided by price index

The names just described correspond to the variable names used in Appendix 1 to which I refer for further details and explanation. As the definition and names of some of the farm account variables changed in 2006, separate description have been prepared for the sub-periods 1990-2005 and 2006-2007. The most significant change in the data definition took place in 2006 where all the account variables were given new names. In 2006 the definition of revenue from crop production and cattle production was also changed. Before 2006, the value of roughage production was *not* considered an income in crop production, and was *not* considered a cost in cattle production. In 2006 (and later) this has changed so that the farm accounts since 2006 include the value of roughage as an income in crop production, and as a cost in cattle production.

The SAS programs mentioned above, and the Excel-programs behind Appendix 1 and Appendix 2, in which the ‘Comments’ include further explanations, are available from the author on request.

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Appendix 1. Definition of variables.

A1. Calculation of variables 1990-2005.

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Year=T; Farm code: N1;

Gross output crop production (QY2)		**Output**		**Price**		**Quantity**	**Actual**
Crop	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**	**quantity**
Grain	N903	S21	Grain	P10	N903/P10	Y21	N420
Pulse	N787	S22	Peas, ripe	P11	N787/P11	Y22	N410
Grass seed	N792	S23	Seed total	P12	N792/P12	Y23	N417
Pulse seed	N793	S24	White clover	P50	N793/P50	Y24	N418
Rape	N795	S25	Rape	P13	N795/P13	Y25	N419
Other seeds	FRO=N796+N794+N797	S26	Seed total	P12	(N796+N794+N797)/P12	Y26	
Potatoes, consume	N788	S27	Potatoes, consume	P14s	N788/P14s	Y27	N413
Sugar beets	N790	S28	Sugar beets	P15	N790/P15	Y28	N415
Roughage	N908	S29	Grain	P10	N908/P10	Y29	
Other sources	AKILDER=N1045-N1030	S210	Contractor	P20	AKILDER/P20	Y210	
Potatoes, industry	N789	S211	Potatoes, industry	P14i	N789/P14i	Y211	N414
Other crops	ANDRE=N798+N819+N826+N907+N964+N786	S212	Vegetables	P51	ANDRE/P51	Y212	
Total	BRUTY2	1		PY2	BRUTY2/PY2	QY2	

Gross output cattle (QY3)				**Price**		**Quantity**	**Actual**
Product	**Gross output, DKK**		**Price index**	**variable**	**Calculated quantity**	**variable**	**quantity**
Milk	N1031	S31	Milk	P1	N1031/P1	Y31	N1070
Other output cattle	N1032	S32	Beef	P2	N1032/P2	Y32	
Total	BRUTY3	1		PY3	BRUTY3/PY3	QY3	
Gross output pigs (QY4)				**Price**		**Quantity**	**Actual**
Product	**Gross output, DKK**		**Price index**	**variable**	**Calculated quantity**	**variable**	**quantity**
Piglets	N989	S41	Piglets	P3	N989/P3	Y41	N1054
Slaughter pigs (net)	N1033	S42	Pig meat	P4	N1033/P4	Y42	N1056
Total	BRUTY4	1		PY4	BRUTY4/PY4	QY4	

Gross output subsidies (QY5)				**Price**		**Quantity**	**Actual**
Product	**Gross output, DKK**		**Price index**	**variable**	**Calculated quantity**	**variable**	**quantity**
Subsidy suckling cows	N1296	S51	Subsidy suckling cows	P53	N1296/P53	Y51	
Male animal subsidy	N1295	S52	Male animal subsidy	P54	N1295/P54	Y52	
Subsidy, grain	HAKOR=N1288+N1300+N1285	S53	Area payment grain	P56	(N1288+N1300+N1285)/P56	Y53	
Subsidy, peas	HAAER=N1292+N1293	S54	Area payment peas	P57	(N1292+N1293)/P57	Y54	
Subsidy, rape	HARAP=N1291+N1299	S55	Area payment rape	P58	(N1291+N1299)/P58	Y55	
Subsidy, fallow	HABRA=N1301+N1302	S56	Area payment fallow	P59	(N1301+N1302)/P59	Y56	
MVJ-subsidy	MVJ=N1282+N1277	S57	Grain	P10	(N1282+N1277)/P10	Y57	
Total	BRUTY5	1		PY5	BRUTY5/PY5	QY5	

Gross output other animal products than Y3 and Y4 (QY6)				**Price**		**Quantity**	**Actual**
Product	**Gross output, DKK**		**Price index**	**variable**	**Calculated quantity**	**variable**	**quantity**
Furred animals	N1037	S61	Mink	P52	N1037/P52	Y61	
Sheep, Horses, etc.	ANDYR=N1035+N1036+N1015	S62	Lamb	P71	ANDYR/P71	Y62	
Subsidy sheep	N1298	S63	Subsidy sheep	P72	N1298/P72	Y63	
Other income animal	N1038	S64	Beef	P2	N1038/P2	Y64	
Poultry products	N1034	S65	Poultry products	P5	N1034/P5	Y65	
Total	BRUTY6	1		PY6	BRUTY6/PY6	QY6	

Gross output other products than Y2 and Y3 (QY7)				**Price**		**Quantity**	**Actual**
Product	**Gross output, DKK**		**Price index**	**variable**	**Calculated quantity**	**variable**	**quantity**
Piglets	N989	S71	Piglets	P3	N989/P3	Y71	
Slaughter pigs (net)	N1033	S72	Pig meat	P4	N1033/P4	Y72	N1056
Poultry	N1034	S73	Poultry products	P5	N1034/P5	Y73	
Furred animals	N1037	S74	Mink	P52	N1037/p52	Y74	
Sheep, horses, etc	ANDYR=N1035+N1036+N1015	S75	Lamb	P71	ANDYR/P71	Y75	
Subsidy sheep	N1298	S76	Subsidy sheep	P72	N1298/P72	Y76	
Other income animal	N1038	S77	Beef	P2	N1038/P2	S77	
Subsidy suckling cows	N1296	S78	Subsidy suckling cows	P53	N1296/P53	Y78	
Male animal subsidy	N1295	S79	Male animal subsidy	P54	N1295/P54	Y79	

Subsidy, grain	HAKOR=N1288+N1300+N1285	S710	Area payment grain	P56	(N1288+N1300+N1285)/P56	Y710
Subsidy, peas	HAAER=N1292+N1293	S711	Area payment peas	P57	(N1292+N1293)/P57	Y711
Subsidy, rape	HARAP=N1291+N1299	S712	Area payment rape	P58	(N1291+N1299)/P58	Y712
Subsidy, fallow	HABRA=N1301+N1302	S713	Area payment fallow	P59	(N1301+N1302)/P59	Y713
MVJ-subsidy	MVJ=N1282+N1277	S714	Grain	P10	(N1282+N1277)/P10	Y714
Total	BRUTY7	1		PY7	BRUTY7/PY7	QY7

Gross output other products than Y2 and Y4 (QY8)

Product	**Gross output, DKK**		**Price index**	**Price variable**	**Calculated quantity**	**Quantity variable**
Milk	N1031	S81	Milk	P1	N1031/P1	Y81
Other output cattle	N1032	S82	Beef	P2	N1032/P2	Y82
Poultry products	N1034	S83	Poultry products	P5	N1034/P5	Y83
Furred animals	N1037	S84	Mink	P52	N1037/P52	Y84
Sheep, Horses, etc.	ANDYR=N1035+N1036+N1015	S85	Lamb	P71	ANDYR/P71	Y85
Subsidy sheep	N1298	S86	Subsidy sheep	P72	N1298/P72	Y86
Other income animal	N1038	S87	Beef	P2	N1038/P2	Y87
Subsidy suckling cows	N1296	S88	Subsidy for suckling cows	P53	N1296/P53	Y88
Male animal subsidy	N1295	S89	Male animal subsidy	P54	N1295/P54	Y89
Subsidy, grain	HAKOR=N1288+N1300+N1285	S810	Area payment grain	P56	(N1288+N1300+N1285)/P56	Y810
Subsidy, peas	HAAER=N1292+N1293	S811	Area payment peas	P57	(N1292+N1293)/P57	Y811
Subsidy, rape	HARAP=N1291+N1299	S812	Area payment rape	P58	(N1291+N1299)/P58	Y812
Subsidy, fallow	HABRA=N1301+N1302	S813	Area payment fallow	P59	(N1301+N1302)/P59	Y813
MVJ-subsidy	MVJ=N1282+N1277	S814	Grain	P10	(N1282+N1277)/P10	Y814
Total	BRUTY8	1		PY8	BRUTY8/PY8	QY8

Gross output other products than Y2 (QY9)

Product	**Gross output, DKK**		**Price index**	**Price variable**	**Calculated quantity**	**Quantity variable**
Piglets	N989	S91	Piglets	P3	N989/P3	Y91
Slaughter pigs	N1033	S92	Pig meat	P4	N1033/P4	Y92
Milk	N1031	S93	Milk	P1	N1031/P1	Y93
Other output cattle	N1032	S94	Beef	P2	N1032/P2	Y94
Poultry products	N1034	S95	Poultry products	P5	N1034/P5	Y95

Furred animals	N1037	S96	Mink	P52	N1037/P52	Y96
Sheep, Horses, etc.	ANDYR=N1035+N1036+N1015	S97	Lamb	P71	ANDYR/P71	Y97
Subsidy sheep	N1298	S98	Subsidy sheep	P72	N1298/P72	Y98
Other income animal	N1038	S99	Beef	P2	N1038/P2	Y99
Subsidy suckling cows	N1296	S910	Subsidy for suckling cows	P53	N1296/P53	Y910
Male animal subsidy	N1295	S911	Male animal subsidy	P54	N1295/P54	Y911
Subsidy, grain	HAKOR=N1288+N1300+N1285	S912	Area payment grain	P56	(N1288+N1300+N1285)/P56	Y912
Subsidy, peas	HAAER=N1292+N1293	S913	Area payment peas	P57	(N1292+N1293)/P57	Y913
Subsidy, rape	HARAP=N1291+N1299	S914	Area payment rape	P58	(N1291+N1299)/P58	Y914
Subsidy, fallow	HABRA=N1301+N1302	S915	Area payment fallow	P59	(N1301+N1302)/P59	Y915
MVJ-subsidy	MVJ=N1282+N1277	S916	Grain	P10	(N1282+N1277)/P10	Y916
Total	BRUTY9	1		PY9	BRUTY9/PY9	QY9

Milk quota (QX0)	**Quantity, kg**					
Milk quota	Before 1995: QX0=N1051-N982/(N1031/N1051).					
	From 1995: QX0=N1067*RF					
	RF before 1998: 1.					
	RF after 1998: (1-0.47*(436-N1068)/436)					
Total quantity	QX0	1				QX0
	Estimated costs, DKK					
Total cost	COSTX0=P73*RENTE*QX0					

Fertilizers etc. (QX1)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Seed	N1077	SX11	Seed	P16		X11
Fertilizers	KUNST=N1085+N1071+N1074	SX12	Fertilizers	P17		X12
Pesticides	N1082	SX13	Pesticides	P18		X13
Lima and marl	N1109	SX14	Lime	P60		X14
Sundries crop prod.	N1095	SX15	Various inputs	P61		X15
Total	COSTX1	1		PX1	COSTX1/PX1	QX1

Feedstuff (QX2)				**Price**		**Quantity**	
Factor	**Cost**		**Price index**	**variable**		**variable**	
Concentrates	N1096	SX21	Concentrates	P21 or P22		X21	
Roughage	GROVF=N1099+N1100	SX22	Grain and concentrates	P62		X22	
Vet and medicine	N1103	SX23	Sundries incl. vet/med.	P23		X23	
Control association	N1102	SX24	Control	P24		X24	
Insemination	N1101	SX25	Insemination	P25		X25	
Other, animals	ANDE6=N1104+N1105	SX26	Sundries incl.vet/med.	P26		X26	
Total	COSTX2	1		PX2	COSTX2/PX2	QX2	

Land (QX3)	**Quantity, ha**						
Land	QX3=N35	1				QX3=N35	N35
Land (alternative)	QX3K=N35*(land quality index)					QX3K	
Total	**Estimated costs, DKK**	1					
Total cost	COSTX3=N35*(N1225+N1226)/N34						

Labour (QX4)				**Price**		**Quantity**	
Factor	**Quantity, hours**						
Total	QX4A=N588				Registered in account	QX4A	
Total	**Estimated cost, DKK**						
Labour	COSTX4=N1126-N1321+N2020	1	Hired labour	PX4=P27	COSTX4/P27	QX4B	

Buildings (BYGN) (auxiliary variable)

Based on depreciation

BYGN=(N1134/0.05)-0.5*N1421

Machinery (QX5)				**Price**		**Quantity**	
Factor	**Cost**		**Price index**	**variable**		**variable**	
Interest	RENT5=(RENTE-INFLA)*N660-(N1265+N1274)*N660/(N660+BYGN)	SX51	Estimated capital cost	P63		X51	
Depreciation	AFSK5=N1138	SX52	Estimated depreciation	P64		X52	
Maintenance	N1112	SX53	Maintenance, equipment	P29		X53	
Insurance	FORS5=N1117*N660/(N660+BYGN)+N1116	SX54	Insurance	P32		X54	

Contractor	MASK5=N1086+N1088+N1106	SX55	Contractor	P20		X55
Fuel	N1090	SX56	Diesel fuel	P19B		X56
Total	COSTX5	1		PX5	COSTX5/PX5	QX5

Other capital (QX6)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Interest, cattle	REKV6=(RENTE-INFLA)*N677	SX61	Estimated capital cost	P65		X61
Interest, pigs	RESV6=(RENTE-INFLA)*N678	SX62	Estimated capital cost	P66		X62
Interest, poultry	REFJ6=(RENTE-INFLA)*N679	SX63	Estimated capital cost	P67		X63
Interest other animals	REAN6=(RENTE-INFLA)*(N681+N649)	SX64	Estimated capital cost	P68		X64
Interest, buildings	REBY6=(RENTE-INFLA)*BYGN-(N1265+N1274)*BYGN/(N660+BYGN)	SX65	Estimated capital cost	P69		X65
Depreciation, buildings	AFBY6=N1134+N1132	SX66	Estimated depreciation	P70		X66
Maintenance, buildings	VEBY6=N1108+N1081	SX67	Maintenance, buildings	P31		X67
Building insurance	FORS6=N1117*BYGN/(N660+BYGN)	SX68	Insurance	P32		X68
Energy	ENER6=N1078+N1089+N1091+N1092+N1094	SX69	Electricity	P19E		X69
Stocks in soil	REJO6=0.5*RENTE*N624	SX610	Fertilizers	P17		X610
Total	COSTX6	1		PX6	COSTX6/PX6	QX6

Machinery excl. energy (QX7)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Interest	RENT5=(RENTE-INFLA)*N660-(N1265+N1274)*N660/(N660+BYGN)	SX71	Estimated capital cost	P63		X71
Depreciation	AFSK5=N1138	SX72	Estimated depreciation	P64		X72
Maintenance	N1112	SX73	Maintenance, equipment	P29		X73
Insurance	FORS5=N1117*N660/(N660+BYGN)+N1116	SX74	Insurance	P32		X74
Contractor	MASK5=N1086+N1088+N1106	SX75	Contractor	P20		X75
Total	COSTX7	1		PX7	COSTX7/PX7	QX7

Other capital excl. energy (QX8)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Interest, cattle	REKV6=(RENTE-INFLA)*N677	SX61	Estimated capital cost	P65		X61
Interest, pigs	RESV6=(RENTE-INFLA)*N678	SX62	Estimated capital cost	P66		X62
Interest, poultry	REFJ6=(RENTE-INFLA)*N679	SX63	Estimated capital cost	P67		X63

Interest other animals	REAN6=(RENTE-INFLA)*(N681+N649)	SX64	Estimated capital cost	P68		X64
Interest, buildings	REBY6=(RENTE-INFLA)*BYGN-(N1265+N1274)*BYGN/(N660+BYGN)	SX65	Estimated capital cost	P69		X65
Depreciation, buildings	AFBY6=N1134+N1132	SX86	Estimated depreciation	P70		X86
Maintenance, buildings	VEBY6=N1108+N1081	SX87	Maintenance, buildings	P31		X87
Building insurance	FORS6=N1117*BYGN/(N660+BYGN)	SX88	Insurance	P32		X88
Stocks in soil	REJO6=0.5*RENTE*N624	SX89	Fertilizers	P17		X89
Total	COSTX8	1		PX8	COSTX8/PX8	QX8
Energy (QX9)						
Fuel	N1090	SX91	Diesel fuel	P19B		X91
Energy	ENER6=N1078+N1089+N1091+N1092+N1094	SX92	Electricity	P19E		X92
Total	COSTX9	1		PX9	COSTX9/PX9	QX9

A1. Calculation of variables 2006-2009.

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Year=T; Farm code= V101010

Gross output crop production (QY2)		**Output**		**Price**		**Quantity**
Crop	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**
Grain	V130505-KGRAIN (definition of K…-variable see footnote)	S21	Grain	P10	V130505/P10	Y21
Pulse	V130130-KV130130 (do)	S22	Peas, ripe	P11	V130130/P11	Y22
Grass seed	V130150-KV130150 (do)	S23	Seed total	P12	V130150/P12	Y23
Pulse seed	V130155-KV130155 (do)	S24	White clover	P50	V130155/P50	Y24
Rape	V130165-KV130165 (do)	S25	Rape	P13	V130165/P13	Y25
Other seeds	FRO=V130170+V130160+V130175-KFRO (do)	S26	Seed total	P12	FRO/P12	Y26
Potatoes, consume	V130135-KV130135 (do)	S27	Potatoes, consume	P14s	V130135/P14s	Y27
Sugar beets	V130145	S28	Sugar beets	P15	V130145/P15	Y28
Roughage	V130520-KGROVF-KHALM (do)	S29	Roughage	P74	V130520/P74	Y29
Other sources	AKILDER=V140215-V170015	S210	Contractor	P20	AKILDER/P20	Y210
Potatoes, industry	V130140-KV130140 (do)	S211	Potatoes, industry	P14i	V130140/P14i	Y211
Other crops (06-08)	ANDRE=V130230+V130125+V130575-KANDRE (do)	S212	Vegetables	P51	ANDRE/P51	Y212
Other crops (2009)	ANDRE=V130231+V130225+V130125+V130575-KANDRE (do)	S212	Vegetables	P51	ANDRE/P51	Y212
Total	BRUTY2	1		PY2	BRUTY2/PY2	QY2

Gross output cattle (QY3)		**Output**		**Price**		**Quantity**
Product	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**
Milk	V140050	S31	Milk	P1	V140050/P1	Y31
Other output cattle	F1=V140060-V186460	S32	Beef	P2	F1/P2	Y32
Total	BRUTY3	1		PY3	BRUTY3/PY3	QY3

Gross output pigs (QY4)				**Price**		**Quantity**
Product	**Gross output, DKK**		**Price index**	**variable**	**Calculated quantity**	**variable**
Pigs, net	F2=V140100-V186530	S42	Pig meat	P4	F2/P4	Y42
Total	BRUTY4	1		PY4	BRUTY4/PY4	QY4

Gross output subsidies (QY5)		**Output**		**Price**		**Quantity**
Product	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**
Subsidy, crops	F5=V202010+V202020	S51	Area payment peas	P57	F5/P57	Y51
MVJ-subsidy	MVJ=V171260	S52	Grain	P10	V171260/P10	Y52
Male animal subsidy	V142070	S53	Male animal subsidy	P54	V142070/P54	Y53
Single payment	V202080	S54	Area payment grain	P56	V202080/P56	Y54
Total	BRUTY5	1		PY5	BRUTY5	QY5

Gross output other animal products than Y3 and Y4 (QY6)		**Output**		**Price**		**Quantity**
Product	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**
Furred animals	F4=V142762-V186610	S61	Mink	P52	F4/P52	Y61
Sheep, Horses, etc.	ANDYR=V142832-V186580-V186630+V142723-V186600	S62	Lamb	P71	ANDYR/P71	Y62
Subsidy sheep	V142710	S63	Subsidy sheep	P72	V142710/P72	Y63
Other income animal	V140200	S64	Beef	P2	V140200/P2	Y64
Poultry products	F3=V142642-V186570	S65	Poultry products	P5	F3/P5	Y65
Total	BRUTY6	1		PY6	BRUTY6/PY6	QY6

Gross output other products than Y2 and Y3 (QY7)		**Output**		**Price**		**Quantity**
Product	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**
Single payment	V202080	S71	Area payment grain	P56	V202080/P56	Y71
Pigs, net	F2=V140100-V186530	S72	Pig meat	P4	F2/P4	Y72
Poultry	F3=V142642-V186570	S73	Poultry products	P5	F3/P5	Y73
Furred animals	F4=V142762-V186610	S74	Mink	P52	F4/P52	Y74
Sheep, Horses, etc.	ANDYR=V142832-V186580-V186630+V142723-V186600	S75	Lamb	P71	ANDYR/P71	Y75
Subsidy sheep	V142710	S76	Subsidy sheep	P72	V142710/P72	Y76
Other income animal	V140200	S77	Beef	P2	V140200/P2	Y77
Subsidy, crops	F5=V202010+V202020	S78	Area payment peas	P57	F5/P57	Y78
MVJ-subsidy	MVJ=V171260	S79	Grain	P10	V171260/P10	Y79
Male animal subsidy	V142070	S710	Male animal subsidy	P54	V142070/P54	Y710
Total	BRUTY7	1		PY7	BRUTY7/PY7	QY7

Gross output other products than Y2 and Y4 (QY8)		**Output**		**Price**		**Quantity**
Product	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**
Milk	V140050	S81	Milk	P1	V140050/P1	Y81
Other output cattle	F1=V140060-V186460	S82	Beef	P2	F1/P2	Y82
Subsidy, crops	F5=V202010+V202020	S83	Area payment peas	P57	F5/P57	Y83
Male animal subsidy	V142070	S84	Male animal subsidy	P54	V142070/P54	Y84
Poultry products	F3=V142642-V186570	S85	Poultry products	P5	F3/P5	Y85
Furred animals	F4=V142762-V186610	S86	Mink	P52	F4/P52	Y86
Sheep, Horses, etc.	ANDYR=V142832-V186580-V186630+V142723-V186600	S87	Lamb	P71	ANDYR/P71	Y87
MVJ-subsidy	MVJ=V171260	S88	Grain	P10	V171260/P10	Y88
Other income animal	V140200	S89	Beef	P2	N1038/P2	Y89
Subsidy sheep	V142710	S810	Subsidy sheep	P72	V142710/P72	Y810
Single payment	V202080	S811	Area payment grain	P56	V202080/P56	Y811
Total	BRUTY8	1		PY8	BRUTY8/PY8	QY8

Gross output other products than Y2 (QY9)		**Output**		**Price**		**Quantity**
Product	**Gross output, DKK**	**share**	**Price index**	**variable**	**Calculated quantity**	**variable**
Milk	V140050	S91	Milk	P1	V140050/P1	Y91
Other output cattle	F1=V140060-V186460	S92	Beef	P2	F1/P2	Y92
Subsidy, crops	F5=V202010+V202020	S93	Area payment peas	P57	F5/P59	Y93
Male animal subsidy	V142070	S94	Male animal subsidy	P54	V142070/P54	Y94
Poultry products	F3=V142642-V186570	S95	Poultry products	P5	F3/P5	Y95
Furred animals	F4=V142762-V186610	S96	Mink	P52	F4/P52	Y96
Sheep, Horses, etc.	ANDYR=V142832-V186580-V186630+V142723-V186600	S97	Lamb	P71	ANDYR/P71	Y97
MVJ-subsidy	MVJ=V171260	S98	Grain	P10	V171260/P10	Y98
Other income animal	V140200	S99	Beef	P2	N1038/P2	Y99
Subsidy sheep	V142710	S910	Subsidy sheep	P72	V142710/P72	Y910
Single payment	V202080	S911	Area payment grain	P56	V202080/P56	Y911
Pigs, net	F2=V140100-V186530	S912	Pig meat	P4	F2/P4	Y912
Total	BRUTY9	1		PY9	BRUTY9/PY9	QY9

Milk quota (QX0)						
Factor	**Quantity, kg**					
Milk quota	QX0=V141190*(1-0.47*(436-V141170)/436)					
Milk quota (2009)	QX0=V141190*					
Total quantity	QX0		1			QX0
	Estimated costs, DKK					
Total cost	COSTX0=P73*RENTE*QX0			P73*RENTE		QX0

Fertilizers etc. (QX1)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Seed	V152010	SX11	Seed	P16		X11
Fertilizers	KUNST=V152080+V152090+V152100	SX12	Fertilizers	P17		X12
Pesticides	V152070	SX13	Pesticides	P18		X13
Lima and merl	V152365	SX14	Lime	P60		X14
Sundries crop prod.	V152140	SX15	Various inputs	P61		X15
Total	COSTX1	1		PX1	COSTX1/PX1	QX1

Feedstuff (QX2)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Concentrates	V152160	SX21	Concentrates	P21 or P22		X21
Own roughage/grain	GROVF=V152170+V152180+V150045	SX22	Grain and concentrates	P62		X22
Vet and medicine	F6=V152210+V152200	SX23	Sundries incl. vet and medicine	P23		X23
Insemination	V152190	SX24	Insemination	P25		X24
Other, animals	V152220	SX25	Sundries incl.vet and medicine	P26		X25
Total	COSTX2		1	PX2	COSTX2/PX2	QX2

Land (QX3)						
Factor	**Quantity, ha**					
Land	QX3=V110010					QX3
Land, alternative	QX3K=V110010*(land quality index)					QX3K
	Estimated costs, DKK					
Total	COSTX3=V110010*(V171110/V111030)=V110010*PX3	1		PX3	V110010	QX3

Labour (QX4)				**Price**		**Quantity**
Factor	**Quantity, hours**		**Price index**	**variable**		**variable**
Total	QX4A=V120060				Registered in account	QX4A
Total	**Estimated cost, DKK**					
Labour	COSTX4=V150140		1Hired labour	PX4=P27	COSTX4/P27	QX4B

Buildings (BYGN) (auxiliary variable)

Based on depreciation

BYGN=(N152630/0.05)-0.5*V290215

Machinery (QX5)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Interest	RENT5=(RENTE-INFLA)*V181175-(V171210)*V181175/(V181175+BYGN)	SX51	Estimated capital cost	P63		X51
Depreciation	AFSK5=V152651	SX52	Estimated depreciation	P64		X52
Maintenance	V150090	SX53	Maintenance, equipment	P29		X53
Insurance	FORS5=V152580*V181175/(V181175+BYGN)	SX54	Insurance	P32		X54
Contractor	MASK5=V150035	SX55	Contractor	P20		X55
Fuel	V152250	SX56	Diesel fuel	P19B		X56
Total	COSTX5	1		PX5	COSTX5/PX5	QX5

Other capital (QX6)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Interest, cattle	REKV6=(RENTE-INFLA)*V180310	SX61	Estimated capital cost	P65		X61
Interest, pigs	RESV6=(RENTE-INFLA)*V180320	SX62	Estimated capital cost	P66		X62
Interest, poultry	REFJ6=(RENTE-INFLA)*(V184550+V184560+V184570)	SX63	Estimated capital cost	P67		X63
Interest other animals	REAN6=(RENTE-INFLA)*(V184580+V184590+V184600+V184610+V184630)	SX64	Estimated capital cost	P68		X64
Interest, buildings	REBY6=(RENTE-INFLA)*BYGN-(V171210)*BYGN/(V181175+BYGN)	SX65	Estimated capital cost	P69		X65
Depreciation, buildings	AFBY6=V152630	SX66	Estimated depreciation	P70		X66
Maintenance, buildings	VEBY6=V152360	SX67	Maintenance, buildings	P31		X67
Building insurance	FORS6=V152580*BYGN/(V181175+BYGN)	SX68	Insurance	P32		X68
Energy	ENER6=V152270+V152230+V152280+V152260	SX69	Electricity	P19E		X69
Stocks in soil	REJO6=0.5*RENTE*V181120	SX610	Fertilizers	P17		X610
Total	COSTX6	1		PX6	COSTX6/PX6	QX6

Machinery excl. energy (QX7)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Interest	RENT5=(RENTE-INFLA)*V181175-(V171210)*V181175/(V181175+BYGN)	SX71	Estimated capital cost	P63		X71
Depreciation	AFSK5=(P64/P28)*V152651	SX72	Estimated depreciation	P64		X72
Maintenance	V150090	SX73	Maintenance, equipment	P29		X73
Insurance	FORS5=V152580*V181175/(V181175+BYGN)	SX74	Insurance	P32		X74
Contractor	MASK5=V150035	SX75	Contractor	P20		X75
Total	COSTX7	1		PX7	COSTX7/PX7	QX7

Other capital excl. energy (QX8)				**Price**		**Quantity**
Factor	**Cost**		**Price index**	**variable**		**variable**
Interest, cattle	REKV6=(RENTE-INFLA)*V180310	SX61	Estimated capital cost	P65		X61
Interest, pigs	RESV6=(RENTE-INFLA)*V180320	SX62	Estimated capital cost	P66		X62
Interest, poultry	REFJ6=(RENTE-INFLA)*(V184550+V184560+V184570)	SX63	Estimated capital cost	P67		X63
Interest other animals	REAN6=(RENTE-INFLA)*(V184580+V184590+V184600+V184610+V184630)	SX64	Estimated capital cost	P68		X64
Interest, buildings	REBY6=(RENTE-INFLA)*BYGN-(V171210)*BYGN/(V181175+BYGN)	SX65	Estimated capital cost	P69		X65
Depreciation, buildings	AFBY6=(P70/P30)*(V152630)	SX86	Estimated depreciation	P70		X86
Maintenance, buildings	VEBY6=V152360	SX87	Maintenance, buildings	P31		X87
Building insurance	FORS6=V152580*BYGN/(V181175+BYGN)	SX88	Insurance	P32		X88
Stocks in soil	REJO6=0.5*RENTE*V181120	SX89	Fertilizers	P17		X89
Total	COSTX8	1		PX8	COSTX8/PX8	QX8

Energy (QX9)						
Fuel	V152250	SX91	Diesel fuel	P19B		X91
Energy	ENER6=V152270+V152230+V152280+V152260	SX92	Electricity	P19E		X92
Total	COSTX9		1	PX9	COSTX9/PX9	QX9

Footnote

BRUTAND=V130130+V130150+V130155+V130165+FRO+V130135+V130140+ANDRE

LAGER=V130610+V130650+V130640+V130630

KAN=V130930*V130650/LAGER

KGRAIN=V130930*V130610/LAGER

KV130130=KAN*V130130/BRUTAND
KV130150=KAN*V130150/BRUTAND
KV130155=KAN*V130155/BRUTAND
KV130165=KAN*V130165/BRUTAND
KFRO=KAN*FRO/BRUTAND
KV130135=KAN*V130135/BRUTAND

KHALM=V130930*V130630/LAGER
KGROVF=V130930*V130640/LAGER
KV130140=KAN*V130140/BRUTAND
KANDRE=KAN*ANDRE/BRUTAND
KANDRE=KAN*ANDRE/BRUTAND

Appendix 2. Price indices.

Source: Agricultural price Statistics, Institute of Food and Resource Economics.

Year	Milk	Beef	Piglets	Pork	Poultry products	Cattle	Pigs	Poultry
X1	P1	P2	P3	P4	P5	P6	P7	P8
1990	108.2031	152.1897	393.0000	116.0149	103.3813	430.9500	116.4950	74.5000
1991	106.2151	139.0371	391.0000	118.4147	98.1479	393.7000	118.3935	73.8000
1992	104.4732	137.4117	368.0000	118.0242	95.1957	377.5500	117.7214	70.8000
1993	102.1465	133.6614	299.0000	91.6459	96.9553	391.2000	96.4434	68.0000
1994	102.3602	136.6556	306.0000	96.1352	96.0972	413.8000	99.8204	66.0000
1995	99.7836	127.8302	338.0000	97.8227	90.3866	402.7000	104.0813	64.0000
1996	98.4529	112.6049	378.0000	107.4163	98.5289	351.0000	117.1289	64.6000
1997	98.5497	111.7715	392.0000	110.5639	105.6011	335.8000	126.6214	70.4000
1998	98.3844	114.8798	273.0000	77.5610	106.2500	350.2000	93.5835	69.0000
1999	96.0658	105.6585	253.0000	74.6560	93.3482	347.4000	89.8814	62.1000
2000	98.2876	110.5913	340.0000	95.5307	94.7484	353.3125	112.1100	60.9000
2001	101.0175	94.7233	418.0000	114.0610	103.7194	320.4165	131.8925	66.4000
2002	100.6949	94.6853	325.0000	90.4083	101.5322	342.8960	109.3740	65.7000
2003	97.7674	92.9984	279.0000	78.8770	100.5169	355.2083	99.4667	61.8000
2004	92.5295	96.5429	313.0000	87.7066	100.5169	322.4375	109.3910	63.6000
2005	88.8722	112.7196	314.0000	88.6883	98.5066	362.8750	110.7144	63.6000
2006	87.8825	122.0235	338.0000	93.1968	92.5962	400.8335	117.9296	56.6000
2007	97.2404	116.3228	293.4286	86.1306	104.6337	428.9323	108.6102	64.7635

Year	Others (mink)	Grain	Peas	Seed for sale	Rape	Potatoes industry	Potatoes consume	Sugar beet
X1	P9	P10	P11	P12	P13	P14i	P14s	P15
1990	57.4000	147.2832	166.3888	94.6466	182.8826	103.1000	91.6000	96.7144
1991	42.8000	155.8853	177.1092	98.6317	164.3988	134.1000	126.9000	100.4764
1992	40.0000	155.9285	186.9670	102.6168	85.8591	103.7000	105.1000	99.2598
1993	61.6000	130.4623	112.8338	104.6729	86.3026	105.8000	81.6000	99.1418
1994	52.4000	120.2955	89.0431	103.7383	102.3441	110.0000	185.6000	100.6702
1995	78.0000	116.8599	84.0460	100.0000	92.1693	106.7000	208.7000	99.4753
1996	141.0000	118.2608	100.3229	99.0000	108.5656	104.6000	114.1000	98.4249
1997	125.7000	109.5640	98.6391	108.9000	105.7907	105.6000	81.6000	98.9873
1998	119.4000	100.0733	80.8956	99.0990	109.2372	105.6000	129.0000	96.2206
1999	87.2000	98.0488	73.9925	94.1400	79.6866	104.6000	140.0000	95.2002
2000	126.4000	103.5188	88.7625	96.0300	87.2592	100.4000	86.0000	101.9497
2001	125.1000	104.9048	103.4280	95.0700	105.4549	92.3000	104.0000	96.3366
2002	130.1000	91.5764	107.8095	106.4700	107.2859	87.7000	87.0000	101.7137
2003	110.6000	98.8186	100.2686	107.5400	108.7367	87.7000	107.0000	100.0519
2004	137.1000	106.1493	90.4463	112.9200	103.3768	87.7000	104.0000	95.3087
2005	141.3000	92.0536	88.2465	100.5000	96.6422	87.7000	78.0000	106.9565
2006	175.2000	97.1210	93.4156	72.3600	112.4620	87.7000	119.0000	75.1304
2007	142.6629	154.6742	139.6699	78.1488	135.3356	87.7000	172.5500	66.1148

Year	Seed (input)	Fertilisers	Chemicals	Energy electric.	Energy fuel	Contractor	Concentra-tes, cattle	Pig feed
X1	P16	P17	P18	P19E	P19B	P20	P21	P22
1990	95.7474	87.6101	92.7458	447.5769	91.8124	74.0615	132.4718	150.4304
1991	94.3242	93.5875	95.1314	446.6018	82.6701	72.6233	133.3326	159.1520
1992	96.6439	87.0280	94.7105	434.9005	79.3632	76.4278	135.4996	161.3653
1993	98.1134	85.1780	88.5378	441.7262	80.1900	79.8050	139.0320	152.8357
1994	94.5242	87.4099	86.2620	427.0995	77.3694	81.6667	136.4000	142.3758
1995	101.9710	93.7709	85.2060	431.0000	81.2112	82.9384	136.4000	138.9700
1996	92.8311	98.5525	95.8237	462.0000	92.5000	85.1621	143.7000	140.7600
1997	93.7088	94.1147	97.6398	472.0000	99.7000	88.8420	147.0000	145.7700
1998	92.7087	92.0260	95.8135	509.0000	88.5500	91.7960	137.0000	137.0800
1999	105.6806	86.4312	109.7657	509.0000	102.2000	93.6553	121.0000	124.0000
2000	96.8159	94.0935	106.7218	539.0000	148.2500	98.1547	126.0000	123.0000
2001	100.4571	107.3899	94.7491	590.0000	136.6000	99.7252	141.0000	134.0000
2002	102.7270	98.5166	98.5291	635.0000	128.3000	102.1201	143.0000	138.0000
2003	102.8380	99.8438	98.5820	692.0000	135.9500	104.4562	134.0000	126.0000
2004	110.6569	113.6454	98.6373	658.0000	155.6000	111.8963	140.0000	127.0000
2005	104.0676	119.6885	96.8686	673.0000	202.9000	118.6101	132.0000	125.0000
2006	105.8412	119.2219	87.7634	731.0000	218.3500	125.1374	130.0000	122.0000
2007	140.7687	139.4896	82.4976	840.6500	218.3500	133.8970	141.7000	145.7900

Year	Veterinary services	Control	Insemi-nation	Sundries, animal prod	Salary	Machinery	Machinery maintenance	Buildings
X1	P23	P24	P25	P26	P27	P28	P29	P30
1990	137.8010	100.0000	115.5000	137.8010	80.6296	76.4751	74.6844	78.8031
1991	143.7923	99.0000	106.3000	143.7923	83.7171	78.6062	76.6576	76.2461
1992	157.4868	100.0000	104.2000	157.4868	86.2147	80.8395	78.9182	77.6817
1993	162.2313	103.0000	100.0000	162.2313	87.9256	80.7373	79.5851	79.8382
1994	166.8228	102.0000	101.0000	166.8228	91.2393	82.1685	81.3708	81.0211
1995	169.8838	102.0000	102.0000	169.8838	94.1400	85.1488	84.2119	83.6397
1996	173.2898	102.0000	103.0000	173.2898	97.3600	88.0506	87.0678	86.5663
1997	177.7714	97.0000	76.0000	177.7714	100.3300	90.8343	89.7830	89.0308
1998	180.7592	95.0000	76.0000	180.7592	103.5900	94.1607	92.9301	91.3413
1999	186.7347	95.0000	80.0000	186.7347	106.9200	95.3839	94.8120	95.0381
2000	192.7102	98.0000	86.0000	192.7102	110.2400	98.1116	97.6126	96.6893
2001	198.6857	105.0000	107.0000	198.6857	113.9100	99.9042	99.9532	100.4909
2002	204.6612	112.0000	114.0000	204.6612	117.4700	101.9842	102.4341	102.8198
2003	212.1306	116.0000	120.0000	212.1306	121.1000	103.4280	104.5467	105.3275
2004	219.6000	103.0000	121.0000	219.6000	124.9400	106.4033	107.6692	107.1157
2005	224.0000	116.4000	118.6000	224.0000	128.2200	109.7547	110.8469	109.9475
2006	230.0000	118.7000	119.8000	230.0000	136.2400	111.8880	114.8148	114.0379
2007	234.6000	121.6675	123.3940	234.6000	140.3272	114.1258	117.1111	120.8802

Year	Buildings maintenance	Insurance	Interest	Taxes	White clover	Vegetables on fields
X1	P31	P32	RENTE	SKAT	P50	P51
1990	83.2808	86.0237	0.1060	0.5000	99.7657	105.7000
1991	84.6295	78.7798	0.0997	0.4000	149.4639	132.9000
1992	84.9580	81.0473	0.0991	0.3800	139.6509	109.6000
1993	85.7494	83.6094	0.0829	0.3600	148.4087	117.7000
1994	87.8137	85.0449	0.0893	0.3600	135.2192	147.9000
1995	91.1375	86.6420	0.0758	0.3600	119.5500	119.0000
1996	91.9655	88.4554	0.0705	0.3400	109.4000	104.5000
1997	93.3907	90.5242	0.0632	0.3400	118.3500	110.7000
1998	94.8750	92.6165	0.0580	0.3400	105.5000	116.9000
1999	94.7912	94.6629	0.0554	0.3200	101.1000	107.6000
2000	97.5651	97.2193	0.0629	0.3200	100.0000	106.6000
2001	100.5036	99.3159	0.0575	0.3000	103.9500	125.9000
2002	101.9313	103.4648	0.0528	0.3000	111.2000	136.7000
2003	104.2905	109.5241	0.0433	0.3000	126.8000	129.2000
2004	110.5061	116.1740	0.0394	0.3000	143.1000	121.3000
2005	114.1353	120.4873	0.0349	0.2800	142.7500	110.1000
2006	118.9971	122.9108	0.0414	0.2800	108.9500	119.0000
2007	128.5169	126.5981	0.0470	0.2500	105.6815	129.7100

Year	Mink	Subsidy suckling cow	Subsidy male animal	Slaughter premium	Area premi-um, grain	Area premi-um, peas	Area premi-um, rape	Area premi-um fallow
X1	P52	P53	P54	P55	P56	P57	P58	P59
1990	57.4000	357.0000	354.0000	194.2000	115.8000	301.1000	416.3000	208.4000
1991	42.8000	360.0000	354.0000	194.2000	115.8000	301.1000	416.3000	208.4000
1992	40.0000	426.0000	354.0000	194.2000	115.8000	301.1000	425.0000	208.4000
1993	61.6000	629.0000	539.0000	194.2000	117.2000	304.7000	368.8000	210.9000
1994	52.4000	888.0000	701.0000	194.2000	170.8000	317.2000	364.7000	278.1000
1995	78.0000	1122.0000	841.0000	194.2000	219.6000	317.2000	368.5000	278.1000
1996	141.0000	1122.0000	842.0000	194.2000	217.8000	314.7000	361.8000	275.9000
1997	125.7000	1122.0000	1045.0000	194.2000	215.5000	311.3000	335.2000	273.0000
1998	119.4000	1122.0000	1045.0000	194.2000	217.2000	313.7000	353.1000	275.1000
1999	87.2000	1122.0000	1045.0000	194.2000	216.9000	313.3000	379.2000	274.5000
2000	126.4000	1228.0000	1204.0000	201.0000	228.0000	281.7000	320.4000	228.0000
2001	125.1000	1357.0000	1380.0000	395.0000	242.4000	278.9000	280.8000	242.4000
2002	130.1000	1490.0000	1562.0000	595.0000	237.2000	273.0000	237.2000	237.2000
2003	110.6000	1490.0000	1562.0000	595.0000	237.8000	273.6000	237.8000	237.8000
2004	137.1000	1490.0000	1562.0000	595.0000	236.5000	277.6000	236.5000	236.5000
2005	141.3000	1490.0000	1103.0000	595.0000	224.1000	236.4000	236.4000	236.4000
2006	175.2000	1490.0000	1033.0000	595.0000	229.6000	236.4000	236.4000	236.4000
2007	133.1520	1490.0000	1033.0000	595.0000	231.4000	236.4000	236.4000	236.4000

Year	Lime	Sundries crop prod.	Grain and concentrates	Cost price machinery	Depreciation machinery	Cost price cattle	Cost price pigs	Cost price poultry
X1	P60	P61	P62	P63	P64	P65	P66	P67
1990	134.8538	94.5474	119.2160	6.1180	76.4751	34.4760	9.3196	5.9600
1991	141.6060	91.9912	112.2839	5.9505	78.6062	29.8031	8.9624	5.5867
1992	153.0182	90.0980	109.6132	6.3136	80.8395	29.4867	9.1940	5.5295
1993	126.9604	89.8989	109.0936	5.6435	80.7373	27.3449	6.7414	4.7532
1994	139.7040	87.7950	104.5694	5.6943	82.1685	28.6763	6.9176	4.5738
1995	142.5000	93.0388	99.8128	4.6662	85.1488	22.0680	5.7037	3.5072
1996	146.7000	95.8232	102.0553	4.3585	88.0506	17.3745	5.7979	3.1977
1997	157.0000	98.7650	106.8965	3.7424	90.8343	13.8350	5.2168	2.9005
1998	163.3000	96.1557	101.7059	3.7664	94.1607	14.0080	3.7433	2.7600
1999	163.3000	92.1895	91.2873	2.8997	95.3839	10.5610	2.7324	1.8878
2000	169.8000	94.4752	92.1303	3.3260	98.1116	11.9773	3.8005	2.0645
2001	176.6000	101.7250	102.4328	3.3468	99.9042	10.7340	4.4184	2.2244
2002	189.0000	103.7998	105.4368	2.9371	101.9842	9.8754	3.1500	1.8922
2003	200.3000	101.3381	99.8648	2.3064	103.4280	7.9211	2.2181	1.3781
2004	202.3000	104.8868	102.0424	2.9155	106.4033	8.8348	2.9973	1.7426
2005	206.3000	103.7574	97.2682	1.8549	109.7547	6.1326	1.8711	1.0748
2006	214.6000	106.7441	100.6088	2.5063	111.8880	8.9787	2.6416	1.2678
2007	225.3300	123.8232	123.7489	3.4238	114.1258	12.8680	3.2583	1.9429

Year	Cost price other anim	Cost price buildings	Depreciation buildings	Lamb	Subsidy sheep	Milk quota		Roughage
X1	P68	P69	P70	P71	P72	P73	INFLA	P74
1990	5.9600	6.3042	78.8031	146.4667	160.0000	0.86	0.0260	136.4842
1991	5.5867	5.7718	76.2461	140.0000	160.0000	0.86	0.0240	144.4557
1992	5.5295	6.0669	77.6817	133.3333	167.0000	1.06	0.0210	144.4957
1993	4.7532	5.5807	79.8382	108.2667	160.0000	1.25	0.0130	120.8967
1994	4.5738	5.6148	81.0211	97.8000	160.0000	1.25	0.0200	111.4753
1995	3.5072	4.5835	83.6397	121.2667	160.0000	1.25	0.0210	108.2916
1996	3.1977	4.2850	86.5663	161.6667	160.0000	1.60	0.0210	109.5898
1997	2.9005	3.6681	89.0308	158.3333	160.0000	1.94	0.0220	101.5306
1998	2.7600	3.6537	91.3413	145.0000	131.0000	2.80	0.0180	92.7358
1999	1.8878	2.8892	95.0381	151.8667	130.0000	3.32	0.0250	90.8597
2000	2.0645	3.2778	96.6893	152.4000	130.0000	3.22	0.0290	95.9287
2001	2.2244	3.3664	100.4909	160.2667	130.0000	3.87	0.0240	97.2131
2002	1.8922	2.9612	102.8198	145.2000	157.0000	2.51	0.0240	84.8619
2003	1.3781	2.3488	105.3275	153.4000	157.0000	4.03	0.0210	91.5731
2004	1.7426	2.9350	107.1157	124.3333	156.0000	3.78	0.0120	98.3663
2005	1.0748	1.8581	109.9475	138.0000	78.0000	4.17	0.0180	85.3042
2006	1.2678	2.5544	114.0379	151.8000	78.0000	3.79	0.0190	90.0000
2007	1.9429	3.6264	120.8802	151.8000	78.0000	4.25	0.0170	120.0000

Appendix 3. Relative land values

The relative quality of Danish farm land for different regions has been estimated earlier (see Rasmussen (1990)).

Based on the trading prices of agricultural properties with 30-60 ha for the period 1984-1991 (Source: TOLD & SKAT; real property) the following relative land quality indices for different regions have been calculated

Table 1. **Relative land values**

Whole country	1
Sjælland (FRB, ROS, KBH, VES, BOR):	1.36
Lolland Falster og Fyn (STS, FYN):	1.44
Sønderjylland (SØJ):	0.90
Østjylland (VEJ, ÅRH):	1.02
Vestjylland (RIB, RIN, VIB):	0.80
Nordjylland (NOJ):	0.91

The figures are calculated as the average of relative trading prices of farms with a size of 30-60 hectares for the period 1984-1991. It is assumed that the relative trading prices roughly reflect the relative land values expressed as relative production potential of farm land. Only the period 1984-1991 is included because: 1973-80: Adaptation to EEC. 1980-1983: Crisis. 1992-1996: New EU schemes with land grants etc. This leaves only 1984-1991 with a price that is expected to reflect the real production value of the land in question